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SCARABAEID BEETLES OF THE GENUS *BRADYCINETULUS*
AND CLOSELY RELATED GENERA IN THE UNITED STATES

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The group of beetles reviewed in this paper have long been known under the name *Bolboceras*. The species found in the United States were last revised by Charles Schaeffer, 1906 (Trans. Amer. Ent. Soc., vol. 32, pp. 249-254). At that time five species were placed in Horn's genus *Bradycinetus*, later incorrectly synonymized under *Bolboceras* (see synonymy under *Bradycinetulus*), and three were assigned to *Bolboceras*. Of these three, *Scarabaeus lazarus* Fabricius had been placed in *Eucanthus* by Westwood, 1848 (Proc. Linn. Soc. London, vol. 1, p. 387), and *Bradycinetus hornii* Rivers and *B. minor* Linell were later removed to *Kolbeus* by Chapin (see synonymy under *Bolbelasmus*).

With the exception of the species *Eucanthus* and *Bolbocerosoma*, here considered correctly placed in recent usage, all of the United States species listed by Schaeffer have been reexamined in this study and reassigned to genera as required by the literature on the group. Also included in this paper are the one species described since Schaeffer's time, *Bolboceras angulus* Robinson; a Mexican species discovered in the United States; another which may eventually be found inside our borders; and four new United States species. Two new genera are proposed. A key, based in part on that by Boucomont, is presented for the genera of the Bolboceratini found in the United States. The genera *Kolbeus*, *Bolbelasmus*, *Bradycinetulus*, and the two new genera *Bolbocerastes* and *Bolborhombus* are discussed, synonymy listed, and a key to the species given. Pertinent references, the type locality and location of the type, and notes on distribution follow for each species. Distribution is also shown on the maps, figures 15 and 16. The genus

Bolbocerosoma, revised by Dawson and McColloch, 1924 (Canadian Ent., vol. 56, pp. 9-15), is not included, nor is the true *Bolboceras*, which was revised under the name *Odontaeus* by J. B. Wallis, 1928 (Canadian Ent., vol. 60, pp. 119-128, 151-156, 168-176).

The number of specimens available for study was greatly increased by material borrowed from museum and private collections. I am grateful for the opportunity to study these added specimens and thank the following who loaned museum specimens: R. H. Beamer, Snow Museum, University of Kansas (KAN); E. C. Becker, Canadian Department of Agriculture (CDA); M. A. Cazier, American Museum of Natural History (AMNH); P. J. Darlington, Museum of Comparative Zoology (MCZ); Henry Dietrich, Cornell University (CU); T. H. Hubbell, University of Michigan (MICH); P. D. Hurd, University of California (CAL); J. N. Knull, Ohio State University (OSU); Hugh B. Leech, California Academy of Sciences (CAS); L. M. Martin, Los Angeles County Museum (LAC); H. J. Reinhard, A. & M. College of Texas (TEX); V. D. Roth, Oregon State College (ORE); M. W. Sanderson, Illinois Natural History Survey (INHS); and G. E. Wallace, Carnegie Museum, Pittsburgh (CARN). My thanks are extended also to those who loaned specimens from their private collections: R. H. Arnett, D. K. Duncan, C. A. Frost, P. C. Grassman, Henry Howden, A. T. McClay, G. H. Nelson, F. H. Parker, Mark Robinson, E. C. VanDyke, and F. G. Werner. I am especially grateful to Henry Howden who examined my types, compared specimens with them and later furnished those records marked with an asterisk. The few records of the eastern *Bradycinetulus ferrugineus* (Palisot de Beauvois) taken from the literature are marked with a double asterisk. Florida records from the literature are from Blatchley (Florida Ent., vol. 12, p. 29, 1925), Alabama records from Löding (Geol. Surv. Alabama Monogr. 11, p. 101, 1945), and North Carolina records from Brimley (The insects of North Carolina, p. 201, 1938).

All other distribution records were copied from labels attached to specimens I examined.

Key to the genera of Bolboceratini

- | | |
|--|--------------------------------|
| 1. Eye entirely divided by ocular canthus..... | 2 |
| Eye not completely divided by ocular canthus..... | 3 |
| 2. Middle coxae narrowly separated; the intercoxal process with a vertical tooth-like elevation in front of the coxae; species usually bicolored... Bolbocerosoma | |
| The intercoxal process without toothlike elevation; species not bicolored; males usually with long cephalic horn..... | Bolboceras ¹ |
| 3. Middle coxae subcontiguous; metasternum linear between the coxae..... | 4 |
| Middle coxae separated by the anterior lobe of the metasternal plate, which is never linear between the coxae..... | 5 |

¹ *Odontaeus* is a synonym. See Introduction and also discussion under *Bradycinetulus*.

- 4. Elytra with 5 discal striae----- **Eucanthus**
 Elytra with 7 discal striae----- **Bolbelasmus**
- 5. Base of elytra margined, metasternal plate pyriform in outline, pronotum without postapical carina, first elytral stria interrupted by scutellum---- 6
 Base of elytra not margined, metasternal plate rhomboid in outline, pronotum with postapical carina, first two elytral striae interrupted by scutellum.
Bolborhombus, new genus
- 6. Apex of tibia of middle and hind legs deeply emarginate on outer side, the angle adjacent to spurs appearing almost as a fixed spur; without prosternal spine----- **Bradycinetulus**
 Apex of tibia of middle and hind legs obliquely truncate; prosternal spine behind anterior coxae transverse, doubly pointed, and remote from acutely angled intercoxal piece----- **Bolbocerastes**, new genus

Genus *Bolbelasmus* Boucomont, 1911

Bolbelasmus Boucomont, Ann. Soc. Ent. France, vol. 79 (1910), p. 335, 1911.
Kolbeus Boucomont, Ann. Soc. Ent. France, vol. 79 (1910), p. 335, 1911.--Chapin, Proc. Biol. Soc. Washington, vol. 59, p. 79, 1946.

Chapin, 1946, placed *Bradycinetus hornii* Rivers and *B. minor* Linell in the genus *Kolbeus*, basing his action on their close relationship to *Kolbeus arcuatus* (Bates). Examination of specimens of these species in comparison with *Bolbelasmus gallicus* (Mulsant) and *B. unicorne* (Shrank), and in the light of Boucomont's key to the genera, places *B. minor* Linell and *B. hornii* Rivers in *Bolbelasmus* rather than in *Kolbeus*.

The genus *Kolbeus* was erected without a genotype by Boucomont, 1911, for the species *Bolboceras arcuatus* Bates and *B. coreanus* Kolbe. Lucas, 1920 (Catalogus . . . Coleopterorum, p. 356), selected *B. coreanus* Kolbe, a species found in Korea and China, as the genotype. The species *B. arcuatus* Bates almost exactly duplicates *Bolbelasmus minor* (Linell) except for the slightly narrower scutellum and lack of a marginal line over the middle half of the base of the pronotum. Since a direct comparison of specimens shows such minor differences, I transfer *arcuatus* Bates to the genus *Bolbelasmus*. Whether the genus *Kolbeus* should be synonymized with *Bolbelasmus* will depend upon an examination of its genotype, a species not available for study at present. Further basis for placing *arcuatus* in *Bolbelasmus* is found in similarity of the aedeagi (see fig. 14).

Genotype.—*Scarabaeus gallicus* Mulsant, Histoire naturelle des Coléoptères de France, Lamellicornes, p. 350, 1842. (Present designation.)

Key to the species of *Bolbelasmus*

- 1. Base of pronotum not margined over middle half; length 7 to 9 mm. (California, México)----- **arcuatus** (Bates)
 Base of pronotum completely margined----- 2

2. Elytral striae coarsely, deeply punctate as in *Eucanthus*; genae obtusely rounded; surface of head and clypeus similarly densely, coarsely punctate in male; frontal carina weakly tri-tuberculate in female; length 7 to 10 mm. (Texas).

minor (Linell)

Elytral striae finely to moderately punctate; genae angulate externally; surface of clypeus roughly, densely, coarsely punctate, remaining surface of head much smoother and more finely punctate in the male; frontal carina not trinodose in female; length 14 mm. (California)----- **hornii** (Rivers)

***Bolbelasmus arcuatus* (Bates), new combination**

FIGURE 14, l

Bolboceras arcuatus Bates, *Biologia Centrali-Americana*, Coleoptera, vol. 2, pt. 2, p. 111, 1887.

Kolbeus arcuatus Boucomont, *Ann. Soc. Ent. France*, vol. 79 (1910), p. 336, 1911.—Chapin, *Proc. Biol. Soc. Washington*, vol. 59, p. 79, 1946.

Bolbelasmus arcuatus (Bates) is a small, dark red-brown, shining species, 7 to 9 mm. in length, readily recognized through the lack of basal margins on both pronotum and elytra. The labrum is widely, shallowly emarginate in front; the clypeus is almost evenly arcuate from side to side; the clypeal suture is distinct; the anterior angles of the pronotum are sharply right angled; the scutellum is elongate; the striae punctures are coarse, in the outside row at the apex very coarse and unusually deep, practically perforating the elytra; the elytra have a row of widely spaced, long, bristlelike hairs near the margin; the male has a single median conical cephalic horn and a low, wide, median thoracic prominence and anterior shallow depression on each side; the female has a wide, more-or-less tri-tuberculate carina on the head and a simple, fine, sharp, transverse carina on the pronotum.

Type.—Type probably among the *Biologia* specimens in the British Museum (Natural History).

Type locality.—Not designated among the localities originally listed, "Mexico, Cordova, Toxpan, Playa Vicente (Sallé), Colima City (Höge); Nicaragua, Chontales (Belt, Janson)."

Specimens examined.—19.

Distribution.—Costa Rica: Tilarán (Guanacaste), San Pedro de Montes de Oca, San José, and *Dominical. Guatemala. México: Colima, El Sabino, Compostela, Mazatlán, Monterey, *Monclova, and *Guadalajara. United States: a single specimen labeled "Los Angeles, California, H. Klages Coll.," in the Carnegie Museum, Pittsburgh, Pa.

FIGURE 14.—Ventral and lateral views of the aedeagi of *Bradycinetulus* and closely related species: a-c, Species of *Bolborhombus*: a, *parvulus*, new species; b, *angulus* (Robinson); c, *schaefferi* (Boucomont). d-g, Species of *Bolbocerastes*: d, *peninsularis* (Schaeffer); e, *regalis*, new species; f, *serratus* (LeConte); g, *imperialis*, new species. h-j, Species of *Bradycinetulus*: h, *ferrugineus* (Palisot de Beauvois); i, *rex*, new species; j, *fossatus* (Haldeman). k-n, Species of *Bolbelasmus*: k, *gallicus* (Mulsant); l, *arcuatus* (Bates); m, *hornii* (Rivers); n, *minor* (Linell).

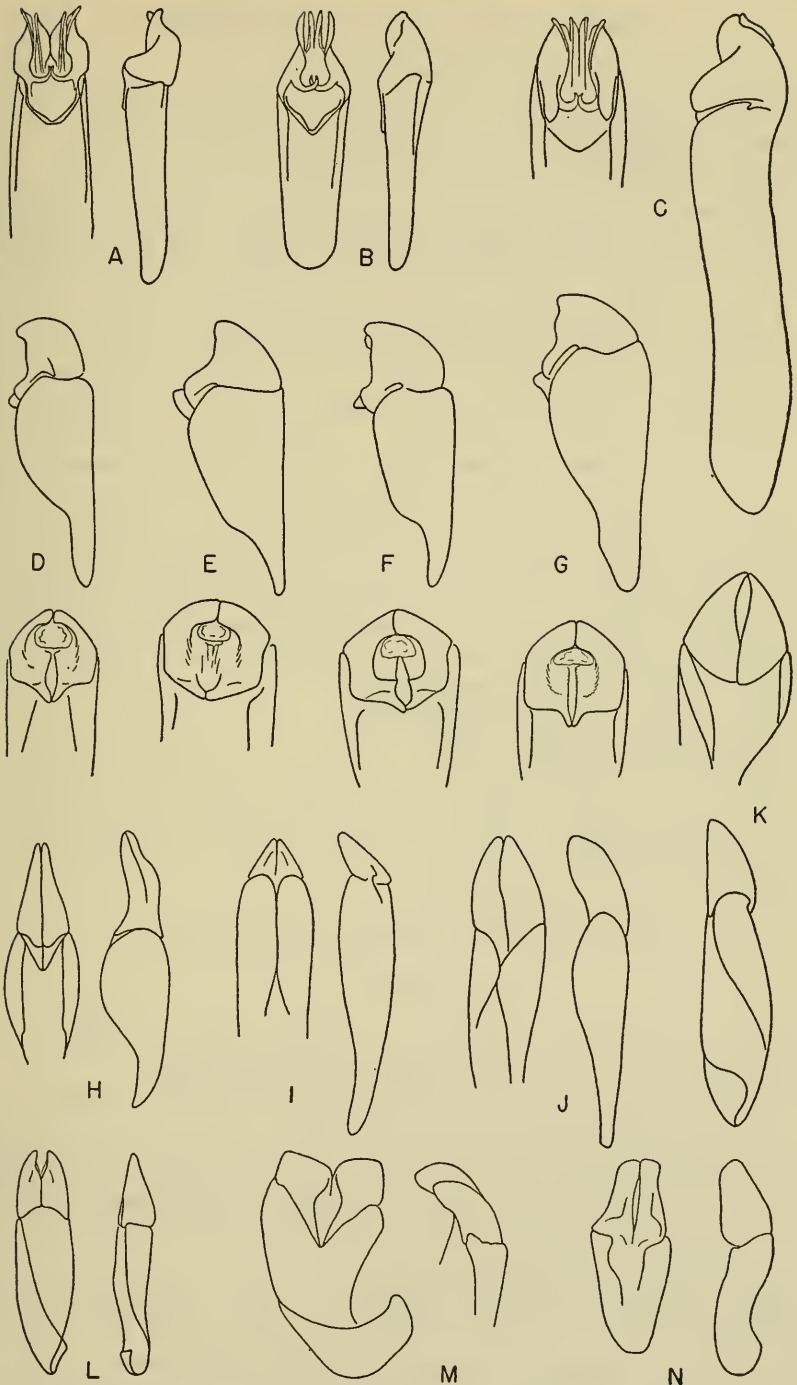


FIGURE 14.—(For explanation see facing page.)

Bolbelasmus minor (Linell), new combination

FIGURE 14, n

Bradycinetus minor Linell, Proc. U. S. Nat. Mus., vol. 18, p. 723, 1895.*Bolboceras minor* Schaeffer, Trans. Amer. Ent. Soc., vol. 32, p. 253, 1906.*Kolbeus minor* Chapin, Proc. Biol. Soc. Washington, vol. 59, p. 79, 1946.

Bolbelasmus minor (Linell) almost exactly duplicates *B. arcuatus* (Bates) except that it averages slightly larger, the punctures are coarser throughout, and the pronotum is completely and distinctly margined basally. It is a small, dark red-brown, shining species, 7 to 10 mm. in length; the labrum is widely, shallowly emarginate in front; the clypeus is almost evenly arcuate from side to side; the clypeal suture is distinct; the anterior angles of the pronotum are sharply right angled; the scutellum is elongate; the striae punctures are very coarse, those at the apex of the elytra being tubular and so deep as to nearly perforate the elytra; near the margin of the elytra is a row of widely spaced, long, bristlelike hairs; the male has the head and clypeus similarly densely punctate, the head bears a median, conical horn, and the pronotum has a low, wide, median prominence with anterior, shallow depressions each side; the female has a wide, transverse, tri-tuberculate carina on the head and a simple, fine, transverse carina on the pronotum.

Type.—Holotype female, USNM 562.

Type locality.—San Diego, Tex.

Specimens examined.—21.

Distribution.—Texas: Hidalgo County, Weslaco, Brownsville, Kingsville, and San Diego.

Season.—May 16 to June 16.

Bolbelasmus hornii (Rivers), new combination

FIGURE 14, m

Bradycinetus hornii Rivers, Bull. California Acad. Sci., vol. 2, p. 61, 1886.*Bolboceras hornii* Schaeffer, Trans. Amer. Ent. Soc., vol. 32, p. 253, 1906.*Bradycinetulus hornii* Cockerell, Ent. News, vol. 17, p. 242, 1906.*Kolbeus hornii* Chapin, Proc. Biol. Soc. Washington, vol. 59, p. 79, 1946.

Bolbelasmus hornii (Rivers) is quite similar to *B. minor* (Linell) but is considerably larger, lighter in color, and has much finer striae punctures. The scutellum is not so elongate, being nearly an equilateral triangle with arcuate sides. Other characters given in the key should readily identify this species.

Type.—Location of type unknown to me. (According to Dr. VanDyke the entire Rivers Collection was purchased by Dr. Walther Horn and it is presumably in the Berlin-Dahlem collection.)

Type locality.—"Sonora, Tuolumne Co., Cal. Found also in Sacramento Co."

Specimens examined.—349.

Distribution.—California: Sequoia National Park, Napa, Kaweah, Camp Greely (Tulare County), Mendocino, Mokelumne Hill, Camp Greely (Fresno County), Three Rivers, El Dorado County, Coulterville, Sonoma County, Potwisha, San Joaquin Experiment Station (Madera County), Mount Diablo, Sacramento, Mineralking, La Jon Pass, Rattlesnake (Placer County), *Calaveras County, and *O'Neals (Madera County). Baja California: Hamilton Ranch.

Season.—January 19 to May 8, with greatest number in April.

Genus *Bradycinetulus* Cockerell, 1906

Bolboceras Kirby (in part), Trans. Linn. Soc. London, vol. 12, pt. 2, p. 459, 1818.

(Type not designated.)

Amechanus Horn (not Thomson, 1864), Trans. Amer. Ent. Soc., vol. 3, p. 48, 1870.

Bradycinetus Horn (not Sars, 1865), Trans. Amer. Ent. Soc., vol. 3, p. 334, 1871.

Bradycellus Schaeffer (not Erichson, 1837), Trans. Amer. Ent. Soc., vol. 32, p. 249, 1906.

Bradycinetulus Cockerell, Ent. News, vol. 17, p. 242, 1906. (Type not designated.)

The genus *Bolboceras* was erected by Kirby in 1818 for the eight species *Scarabaeus mobilicornis* Linnaeus, *S. mobilicornis* var. *testaceus* Fabricius, *S. quadridens* Fabricius, *S. farctus* Fabricius, *S. lazarus* Fabricius, *S. cyclops* Olivier, *S. cephus* Fabricius, and *Bolboceras australasiae* Kirby. Technically no genotype was designated although he wrote, "My details of *Bolboceras* were taken from *B. quadridens*." Nearly all of the species mentioned have since been moved to other genera. Curtis, 1829 (British Ent., vol. 1, pt. 1, p. 74), selected the species *Scarabaeus mobilicornis* Fabricius as the type of *Bolboceras*. Therefore, since our species of *Odontaeus* are congeneric with *mobilicornis*, they now take the generic name *Bolboceras* and it becomes necessary to find an available name for those species we have formerly placed in *Bolboceras*. A search of the literature indicates that name must be *Bradycinetulus*, as shown in the synonymy.

Characters for *Bradycinetulus*, in addition to those listed in the key to genera, include the following: The mandibles are evenly arcuate externally; the median prominence of the pronotum is developed into a pair of horns in the male; the scutellum is wider than long and distinctly punctate with fine to moderate punctures; and the posterior vertical face of the prosternal intercoxal piece is wide and flat, with the ventral edge evenly arcuate or slightly angulate at middle. The three species placed here are all large, 17 to 21 mm. in length by 10 to 12 mm. in width. They are sufficiently differentiated in the following key.

Genotype.—*Scarabaeus ferrugineus* Palisot de Beauvois, 1809. (Present designation.)

Key to the species of *Bradycinetulus*

1. Eye canthus nearly straight edged laterally, wide clypeal horn of male bisinuate apically, the external angles projecting forward, acute, and scarcely thicker than the adjacent edges, which converge posteriorly; median thoracic horns heavy, directed upward, their sharply rounded tips recurved posteriorly (North Carolina to Florida and Mississippi).

ferrugineus (Palisot de Beauvois)

Eye canthus notched or emarginate, not straight edged laterally-----2

2. Wide clypeal horn of male distinctly trinodose apically, the external angles not projecting beyond median point, lateral edges parallel; median thoracic horns heavy, projecting forward and outward, sharply rounded and very little recurved (Nebraska to Texas and Arkansas)----*fossatus* (Haldeman)

Apex of clypeal horn of male widely truncate, straight across, the external angles slightly nodose, lateral edges parallel over apical two-fifths, then diverging to base; median thoracic horns slender, directed forward and upward, basally flattened in front and behind (Texas)----*rex*, new species.

Bradycinetulus ferrugineus (Palisot de Beauvois), 1809

FIGURE 14, h: PLATE 3

Scarabaeus ferrugineus Palisot de Beauvois, Insectes recueillis en Afrique et en Amérique, livr. 6, p. 90, 1809.

Bolboceras lecontei Dejean, Catalogue des Coléoptères . . ., ed. 3, vol. 3, p. 149, 1833.

Athyreus ferrugineus Klug, Abh. Berlin Acad., 1843, p. 22.

Bolboceras ferrugineus Lacordaire, Histoire naturelle des insectes, vol. 3, p. 143, 1856.

Amechanus ferrugineus Horn, Trans. Amer. Ent. Soc., vol. 3, p. 48, 1870.

Bradycinetus ferrugineus Horn, Ent. Amer., vol. 1, p. 89, 1885.

Athyreus (Bradycinetus) ferrugineus Boucomont, in Wyttsmann, Genera insectorum, fasc. 7, p. 8, 1902.

Bradycinetus ferrugineus Schaeffer, Trans. Amer. Ent. Soc., vol. 32, p. 250, 1906.

Bradycinetulus ferrugineus Cockerell, Ent. News, vol. 17, p. 242, 1906.

Bolboceras (Amechanus) ferrugineus Boucomont, Ann. Soc. Ent. France, vol. 79, p. 341, 1910.

Type.—Location of type unknown to me.

Type locality.—South Carolina.

Specimens examined.—107.

Distribution.—North Carolina: West End, Southern Pines, **Beaufort, *Hamlet, *Carolina Beach, and **Tarboro. South Carolina: Meredith, Florence, Windsor, Johns Island, and Bulls Island. Georgia: Bainbridge, Spring Creek (Decatur County), and Augusta. Florida: Port Saint Joe, Kissimmee, Orlando, Sanford, Enterprise, Miami, Crescent City, Indian River, Cedar Keys, *Lutz, *Wacissa, *Gainesville, **Saint Augustine, **LaGrange, and **Dunedin. Alabama: **Lee County, and **Mobile County. Mississippi: Ocean Springs, Biloxi, and Leakesville.

Season.—March 11 to September 23, with the largest number of records in June and July.

Bradycinetulus fossatus (Haldeman), 1853

FIGURE 14, j; PLATE 3

Bolboceras fossatus Haldeman, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, p. 362, 1853.

Amechanus fossatus Horn, Trans. Amer. Ent. Soc., vol. 3, p. 48, 1870.

Bradycinetus fossatus Schaeffer, Trans. Amer. Ent. Soc., vol. 32, p. 250, 1906.

Bradycinetulus fossator Cockerell, Ent. News, vol. 17, p. 242, 1906.

Bolboceras (*Amechanus*) *fossatus* Boucomont, Ann. Soc. Ent. France, vol. 79, p. 341, 1910.

In a few male specimens of *Bradycinetulus fossatus* (Haldeman) the outer cariniform edges bordering the thoracic fossae show a slight tendency to break near the upper end to form a second inner carina, a step toward the condition found in *Bolbocerastes*.

Type.—In LeConte collection, MCZ.

Type locality.—Texas.

Specimens examined.—102.

Distribution.—Nebraska: Imperial. Kansas: Reno County, Medora, and Sylvia. Oklahoma: Noble County, Cleveland County, Payne County, Thomas, Cleo Springs, Ferris, and *Alva. Arkansas: Pine Bluff. Texas: Fedor, Henrietta, Tyler, Jacksonville, Goldthwaite, Robinson, Lexington, Jefferson, College Station, Lindale, Bexar County, Dallas, Victoria, Columbus, Paris, Austin, San Antonio, and Morris County.

Season.—May 16 to August, with most records in June.

Bradycinetulus rex, new species

FIGURE 14, i; PLATE 3

Holotype male, length 21 mm., width 13 mm. In general appearance very similar to *Bradycinetulus ferrugineus* (Palisot de Beauvois) and *B. fossatus* (Haldeman), rufo-testaceous, moderately shining, densely hairy beneath. Clypeus perpendicular in front, the nearly flat, vertical face extending upward to form a broad truncate horn about one-fourth wider than high. The face and sides of the horn reticulate, the enclosed spaces concave, shallow, and coarse; the truncate apex scarcely thickened, with the external angles very slightly nodose; the sides parallel over apical two-fifths, diverging posteriorly; margin thin, irregularly serrated, elevated just before the eye canthus to a very moderate right-angled prominence, the posterior edge of which continues posteriorly as a low, sharp carina separating the eye canthus from the flattened discal surface of the head. Canthus sloping away from the discal level of head; anterior and lateral margins sinuate to

the rounded, elevated, anterior angle, surface ridged inward from the angle, depressed along anterior edge and in posterior angle. Margin of head along inner edge of the eye with a reflexed carina, which gradually curves away from the eye, increases to a maximum height, then angles sharply inward and backward and sharply descends to general level of head; head surface, including eye canthi, reticulate-tuberculate-punctate, very rough anteriorly on the concave posterior of the clypeal horn, gradually smoother over discal area, which is bounded posteriorly by a low, rounded ridge between the eyes; the reticulation and tubercles of the discal area flatten until the outlines of the coarse, shallow punctures are barely traceable; head behind the ridge smooth at middle but gradually roughened near the eyes.

Pronotum similar to that of *B. ferrugineus* (Palisot de Beauvois) but with the horns of the median prominence and the high lateral edges of the depressions much farther forward. The anterior edge of the pronotum very finely margined, the middle third arching slightly over the base of the head, each outer third without a curve, straight, diverging anteriorly to the right-angled anterior angles, slightly concave close along these straight edges, then very obtusely convex and rounding into the deep lateral depressions, the middle third with a smaller, closer, parallel convexity and a moderate concavity at each end; pronotum laterally with two very large deep fossae on each side, the lower wider and less deep, widely sinuating the lateral margin from middle to near the anterior angles, the upper very deep, the outer edge thrown up in a high, thin, curving edge which descends to the posterior boundary of the lower cavity; posterior angles distinct but obtusely rounded; sides and base margined, the edge rather finely serrate laterally; pronotum convex basally; disc forming a broad median prominence with a sharp horn pointing upward on each side, the horns being rather sharply undercut below and basally flattened in front and behind; a deep median line from base forward over the median prominence and down between the horns. Surface of the pronotum alutaceous and finely scabrous back of the anterior margin, especially at the sides, then shallowly, coarsely punctate over the inner lower surface of the lateral fossae; posterior angles similarly finely alutaceous and closely, coarsely, shallowly punctate; elsewhere finely to minutely, sparsely punctate throughout, except for the very smooth surface of the deeper fossae; and with a large group of close very coarse punctures on each side back of the horn and above the deeper fossa, another group following the median line and spreading anteriorly to bases of the horns.

scutellum finely punctate. Elytra not strongly shining; minutely

alutaceous under high magnification; margined at base; striae moderately impressed, the strial punctures fine, moderately deep; first stria interrupted at scutellum; the second indistinct near scutellum.

Metasternal lobe separating the middle coxae half as wide as the plate behind the coxae; lateral edges sharply carinate.

Female unknown.

Type.—Holotype male, USNM 61455.

Type locality.—Sarita, Tex. Holotype collected on bare sand, Nov. 30, 1911.

Paratypes.—One male, CAS, Corpus Christi, Tex., June 28, 1942, E. S. Ross; one male, in Mark Robinson collection, Kingsville, Tex., C. T. Reed.

Remarks.—*Bradycinetulus rex* may be readily separated from the two closely allied species *B. ferrugineus* (Palisot de Beauvois) and *B. fossatus* (Haldeman) by the obvious differences in the clypeal and thoracic horns. It may be noted also that the last two species have only a single deep fossa on each side of the pronotum, while in *B. rex* this is doubled, the lower cavity sinuating the lateral margin.

Bolbocerastes, new genus

This genus is closely allied to *Bradycinetulus* but differs in that the apex of the tibia of the midleg and hind leg is obliquely truncate, the scutellum is smooth or minutely punctate, the mandibles are parallel, nearly straight sided and bent sharply inward anteriorly, the sides and anterior edges forming a rectangle, the median prominence of the pronotum is without horns, two elevated carinae are present on each side of the pronotum, the prosternal spine behind the anterior coxae is transverse, doubly pointed and remote from the acutely angled intercoxal piece, and the aedeagus of the male is of a characteristic form (see fig. 14).

Genotype.—*Bolbocerastes regalis*, new species.

Key to the species of *Bolbocerastes*

1. Anterior clypeal horn of male widely truncate; anterior and median horns of female usually equal in width, smooth back of median horn (Arizona, Nevada, California)----- **regalis**, new species
- Anterior clypeal horn of male narrowly truncate or rounded; anterior horn narrower than median horn in female, punctate back of median horn. 2
2. Dull, dark reddish brown; elytral striae extremely fine, not impressed, the intervals completely flat even in reflected light, strial punctures very fine; fully developed male with the anterior clypeal horn narrowly rounded and very little advanced, much closer and more nearly in line with the strongly developed lateral horns than in *serratus* and *imperialis* (California, Baja California)----- **peninsularis** (Schaeffer)
- Elytral striae fine to moderate, usually at least slightly impressed, the intervals weakly convex in reflected light; fully developed males not as above--- 3

3. Lateral serrations of pronotum arising between the two edges of a doubly carinate margin; elytral striae moderately impressed, striae punctures distinct; color reddish brown, usually quite strongly shining; tip of clypeal horn rounded in male, inner thoracic carina without secondary angle at upper end; female cephalic horn rarely higher than clypeal horn, carina extending back from clypeal horn on each side sharp, strong, usually dark colored, lateral secondary horns nearer midway between clypeal and cephalic horns than to the cephalic horn, discal area of head distinctly punctate throughout, fine punctures of median thoracic prominence distinct and noticeable (Kansas, Oklahoma, Texas, New Mexico) *serratus* (LeConte) Pronotum without or with only traces of a doubly carinate margin laterally, the serrations appearing as thickenings of a single sharp edge; well developed males with a secondary angle at upper end of inner thoracic carina. . . . 4
4. Elytral striae much less distinct, the elytra smoother in appearance, nearly as in *peninsularis*, color lighter, more yellow-brown, less strongly shining; fully developed male with tip of clypeal horn narrowly truncate and well forward from the lateral horns, upper lateral thoracic carina of the male frequently with a noticeable secondary angle at upper end; female median cephalic horn often very high, usually higher than clypeal horn, carina extending back to lateral secondary horn weak, sometimes obliterated, not darker in color, the lateral secondary horns weak, usually much farther back, more nearly in line with the cephalic horn, discal area of head usually with only scattered punctures behind median horn (Baja California, California, Arizona, western Texas)----- *imperialis*, new species Elytral striae deeper, color red-brown, more strongly shining as in *serratus*, otherwise as above (Kansas)----- *imperialis kansanus*, new subspecies

Bolbocerastes regalis, new species

FIGURE 14, e; PLATE 4

Holotype male, length 18 mm., width 11.5 mm. In general appearance closely similar to *Bolbocerastes serratus* (LeConte), ferruginous, shining, densely hairy beneath. Clypeus perpendicular in front, the flat vertical face extending upward to form a broad truncate horn, the vertical height subequal to base, the lateral edges arcuate from base to upper edge, narrowing at basal third to half the basal width then expanding to three-fourths, the upper edge weakly emarginate and subparallel with base, shining black in color, rounded and knoblike at each end; the sharply defined lateral triangular faces of the horn concave and posteriorly elevated from base into secondary horns half as high; posteriorly the broad curving slope of the clypeal horn merges into the flattened upper surface of the head, this quadrangular surface with a secondary horn at each anterior angle and with sharply defined carinalike subparallel lateral margins from which the prominent, widely explanate eye canthus slopes downward and outward. Occipital area smooth; gradually, finely, closely, shallowly punctate anteriorly; anterior and lateral faces of clypeal horn, labrum, eye canthi, and upper surface of mandibles finely reticulate-scabrous.

Broadly rounded labrum twice as wide as long. Upper surface of mandibles concave, sides straight, bent at right angles in front.

Pronotum retuse in front; the deeper lateral impressions extending upward on each side of the median prominence and bounded laterally by two carinae on each side; the lower external carina starting near the serrate lateral thoracic margin and extending upward parallel with the basal thoracic margin for a distance equal to half the length of the lateral margin; the upper carina starting inside the upper end of the lower and extending upward for a slightly shorter distance; viewed from the side the lower carina is nearly straight, the upper end with a gentle downward curve, the lower end with a noticeable but low toothlike elevation; in outline the upper carina is half as high as long, sloping upward from a sharp basal curve to a rounded right-angled peak, then down on a concave curve to a noticeable secondary angle. The median pronotal prominence sharply declivous in front, upper surface divided by an anteriorly increasingly depressed median line, the parallel sides with sharply rounded edges anteriorly; retuse front impunctate except for a subapical line of close, weak-to-obsolete punctures; median prominence with fine, close punctures shading to minute punctation across base; a few obsolete moderate punctures in the shallow lateral depressions outside the carinae; basal bead distinct. Lateral edges strongly serrate, as in *Bolbocerastes serratus* (LeConte).

Elytra not strongly shining; striae scarcely impressed; strial punctures fine, moderately close, intervals practically flat, very minutely punctulate.

Metasternal lobe separating middle coxae half as wide as plate behind the coxae.

Female allotype, length 21 mm., width 10 mm. Similar to the male except that the thoracic prominences are much less developed and the head is different. The vertical face of the clypeus is only half as high as the basal length, the upper edge less than half the basal length, and from each end a curving carina extends outward to top of the secondary horn or tubercle; from the flattened area back of and about twice as high as the secondary tubercles arises a widely truncate median horn; anterior to this median horn the surface is reticulate-scabrous, posteriorly it is smooth.

Type.—Holotype male, USNM 61076.

Type locality.—The holotype bears the following label data: "3206. Colo. R. bottom. Monument 204. Mex. Bd. line Mar. 20-31, '94. USNM Acc. No. 28133 Dr. E. A. Mearns." Monument 204 is approximately 20 miles south of Yuma, Ariz., near San Luis, México, its exact location being lat. 32° 29' 03.59'', long. 114° 46' 44.79''.

Allotype and paratypes.—Allotype and 97 paratypes bear data as follows: Nevada: 1, Hawthorn, June 8, 1943, Wallace; 1, Mount Charleston, 8,000–10,000 feet, Aug. 6, 1944, Zinn.

California: 2, Baker, Mar. 27, 1935, and April 1935, Saylor; 1, California (State label only); 3, Coachella, May 12, 13, 17, 1927, Van Duzee; 3, Coachella, Riverside County, Apr. 28, 1928, May 9, 1927, July 15, 1927, Wymore; 2, Coachella Valley, May 9, 1927, Van Dyke, Aug. 20, 1949, v. d. Bosch; 1, Coyote Wells, Imperial County, June 5, 1949, Hurd; 1, Essex, Apr. 29, 1937; 1, Holtville, June 28, 1936, Cazier; 14, Imperial County, Carrizo Light, Mar. 14, 17, 18, 22, 1928, Searl; 1, Indian Wells, Riverside County, Apr. 25, 1939, Martin; 8, junction of Highways 78 and 99, Imperial County, Apr. 15, 1944, Tieman; 4, Mecca, Mar. 25, 1922, Benedict; 3, Murrays Dam, San Diego County, Cottle; 1, Needles, Apr. 1, 1941, Linsley; 2, Palm Springs, May 20, 1905, May 9, 1932; 2, San Clemente Island, Apr. 2, 3, 1939, Channel Islands Biological Survey, Von Bloeker; 1, San Diego County, Mar. 10, 1928, light, Well; 7, Yermo, San Bernardino County, Apr. 11, 1936, Comstock, Sept. 6–30, 1939, Pierce.

Arizona: 7, Arizona (State label only); 4, Ehrenberg, Oct. 18, 1938, Mar. 21, 23, 30, 1939, Parker; 6 (includes allotype), Gila Bend, Mar. 1, 1930, Lebart; 1, Holbrook, May 5, 1941, Dukes; 1, Navaho County, Duncan; 1, Phoenix; 1, Red Rock, Spring 1930, Burdett; 1, Tucson, April 192–, Duncan; 11, Yuma, February 1910, Carlson, Mar. 12, 18, 1912, Slevin, May 15, 1939, Aitken.

México, Sonora: 1, Choya Bay, Mar. 27, 1949, Bradt; 1, 30 miles southwest of Sonoyta, 500 feet, Mar. 31, 1949, Bradt; 4, Puerto Libertad, Mar. 15, 1939, Parker.

Paratypes in AMNH, CAS, LAC, KAN, MCZ, CAL, CU, OSJ, MICH, INHS, USNM, and the private collections of Mark Robinson, Henry Howden, C. A. Frost, A. T. McClay, F. H. Parker, D. K. Duncan, and R. H. Arnett.

Remarks.—*Bolbocerastes regalis* varies from 16 to 20 mm. in length and from 10 to 12.5 mm. in width. It is closely similar to *B. serratus* (LeConte) but the males differ noticeably in having a higher, wide, truncate clypeal horn, smoother, less punctate pronotum, and on each side a doubly angulate inner pronotal carina which is always higher in the middle. In *B. serratus* (LeConte) the anterior clypeal horn is bluntly rounded, the pronotal punctures are more evident throughout, and the inner lateral pronotal carina is not doubly angulate or higher in the middle. The truncated tops of the anterior and median horns are about equal in width in females of *B. regalis* and the whole anterior part of the head, including clypeal and cephalic horns, appears higher than the posterior part, like an elevated snout. The lateral horns are most prominent in this species.

Bolbocerastes imperialis, new speciesFIGURE 14, *g*; PLATE 4

Holotype male, length 19 mm., width 11 mm. Very similar to *Bolbocerastes serratus* (LeConte); ferrugineous; moderately shining; hairy beneath. Vertical face of clypeal horn inclined forward about 30 degrees from perpendicular, slightly convex when viewed from side, height seven-tenths width at base, width of the truncate apex slightly less than half the basal width, the apex arcuate posteriorly at each side; the posterior face of the horn concave from side to side between the weakly carinate edges, which converge very slightly from apex to base. General level of the head slightly more than half the height of the clypeal horn above the wide, truncate labrum; this flattened area sloping upward posteriorly and bounded by a ridge or carina deeply arcuate posteriorly from the anterior edge of one eye to the other and continuing forward on each side to the tips of the weakly elevated, right-angled, secondary horns, then converging to the anterior edge of the clypeal horn and forming the upper edge of the triangular lateral area at base of the horn; flattened area of head slightly depressed laterally above the prominent quadrangular eye canthus, which slopes arcuately downward, outward, and finally upward at the outer angles; entire surface in front of the curving posterior ridge densely, roughly punctate, smooth back of the ridge. Mandibles concave dorsally; strongly angled front and back.

Pronotum retuse in front and with serrate lateral margins as in *B. serratus* (LeConte) and *B. regalis*; the median prominence and lateral carinae nearly as in *B. regalis* but with the outer carina with the upper end curving slightly away and not quite parallel with the basal margin when viewed from the side; the inner lateral carina, viewed from the side, with the lower end rising abruptly to a right angle, then sloping evenly upward to a right-angled peak at middle, then down in a strongly sinuate in-and-out curve; both carinae, viewed from directly in front, evenly arcuate, with the peak angle of the inner carina strongly bent inward; the median prominence slightly constricted toward the base, with the sides weakly angulate in front of the constriction and the surface more broadly and less deeply concave from side to side than in *B. regalis* and evenly arcuate from front to back; a distinct median line evident basally; the apical and deeper lateral pronotal depressions extending upward between the lateral carinae; the median prominence impunctate except for half a dozen or so close, moderate punctures on each side at base of the vertical sinus; above these about twenty or so scattered fine punctures on the inner slope of the vertical sinus, and a very few fine punctures indicating a sub-apical line; median prominence and lateral basal area back of the

carinae closely, finely punctate; smoother and more finely punctate across base at middle; groups of moderate punctures in the depressions back of the carinae and an irregular row of close moderate punctures just inside the basal bead.

Scutellum closely, minutely punctate. Elytra one-sixth wider than long; extremely, finely alutaceous under moderate magnification; striae scarcely impressed; strial punctures fine, distant about four diameters; intervals with very minute scattered punctures.

Metasternal lobe separating middle coxae one-third as wide as the plate behind the coxae.

Allotype female, length 14 mm., width 9 mm. Similar to the male except that the pronotal prominences are less strongly developed and the head is different. The vertical face of the clypeus is one-third as high as basal length; its upper truncate edge also one-third the length of the base; the concave triangular sides of the clypeal horn with the upper edge about twice as long as the anterior edge; the wide truncate frontal horn is about three-fourths as high as wide and about four times as high as the low secondary lateral horns, or tubercles.

Type.—Holotype male, USNM 61077.

Type locality.—Imperial County, Calif., "on the Experiment Farm," June 1912, J. C. Bridwell.

Allotype and paratypes.—Allotype female and 210 paratypes bear the following data: Texas: 1, Castolon, June 1, 1928, Bibby; 1, Tornilla Flat, Big Bend National Park, July 12, 1948, desert, 3,650 feet, at light, Werner and Nutting; 2, Boquillas, Brewster County, July 7, 1948, C. and P. Vaurie; 1, Marathon, June 14, 1948, D. Rockefeller Expedition, Cazier; 1, Reeves County, June 10, 1939, Robinson.

New Mexico: 1, Artesia, July 29, 1937, D. J. and J. N. Knull; 1, White Sands, July 23, 1933, Benedict.

Arizona: 4, Agua Fria, Aug. 6, 1917, Bequaert, June 26, 1938, Duncan; 2, Aquila, Maricopa County, Aug. 21, 22, 1927, CU lot 542, sub 330; 2, Arlington, July 25, 1948, Anderson; 15, Arizona (State label only); 5, Avondale Ranch, Agua Fria River, Aug. 7, 1917, Wheeler leg.; 4, Baboquivari Mountains, July 24, 1941, Beamer, July 24, 1941, Todd; 2, Buckeye, July 30, 31, 1935, at light, Christenson; 1, Cashion, Maricopa County, Aug. 25, 1949, at light, Werner and Nutting; 5, Cibola, August 1911; 1, Continental, Pima County, July 29, 1948, Ball; 1, Coyote Mountains, Aug. 4, 7, 1916; 1, Dome, July 21, 1924, Van Duzee; 4, Ehrenberg, July 20, 1946, June 12, 1943, Grassman, July 18, 1939, Stager, June 21, 1938, Parker; 10, Globe, Duncan, Sept. 8, 1930, July 11, 1931, July, August, Duncan and Parker; 7, Hope, Yuma County, Aug. 12, 1948, greasewood desert, 1,400 feet, at light, Werner and Nutting; 1, Hot Springs, July 16 (year not given), at light, Morrill; 2, Huachuca Mountains; 2, Kits

Peak, Rincon, Baboquivari Mountains, Aug. 1, 4, 1916, about 1,050 feet; 1, Littlefield; 1, Marinette, Aug. 4, 1918, Schiffl; 1, Olberg, Sept. 13, 1936, Crandall; 1, Palmerlee; 8, Phinax (sic), September and November 1921; 17, Phoenix, Sept. 12, 1935, Crandell, May 12, 1934, Parker, May 29, 1922, Odell, Aug. 2, 1917, CU Biol. Expedition, May 17, 1944, Parker, Apr. 29, 1941, Parker, May 7, 1918, Bradley, Sept. 12, 1926; 1, Pima County, Sept. 1, 1925, Marsh; 1, Prescott; 2, Sacoton, Gilman; 1, Safford, September (no date given), Duncan; 2, San Bernardino Ranch, Cochise County, 3,600 feet, sycamore-willow in valley at light, July 25, 1949, Werner and Nutting, July 16, 1949, light, Parker; 1, San Luis, Yuma County, Aug. 11, 1940; 1, Talklai, Pollock; 20, Tucson, July 21 (no year given) Hubbard and Schwarz, July 30, 1937, Parker, August 1912, Breitenbecker, Aug. 20, 1932, Flock, August 1935, Wharton, October 1927, Hamilton (2,500 feet), July 10, 1950, Aug. 8, 1950, Bradt, Oct. 14, 1919; 3, Wellton, June 13, 1939, at light, Stitt; 1, Welton, Aug. 9, 1917, Wheeler leg.; 1, Yuma.

California: 7, Blythe, May 19, 1942, Allen, Aug. 26, Hurd, April 16, 1945, Constantine, May 19, 1943, Vargas, July 22, 1947, July 8, 1947; 4, Blythe, Riverside County, July 24, 1947, Aug. 24, 1947, MacSwain; 2, California (State label only); 29, Coachella, Riverside County, Apr. 28, 1927, May 9, 12, 17, 28, 1927, Wymore, May 22, 1928, Van Dyke, May 13, 1917, Van Duzee; 2, Coachella Valley, Sept. 8, 1929, Comstock, Aug. 20, 1949, v. d. Bosch; 1, El Centro, Aug. 28, 1948, light trap; 8, Holtville, June 1936, Ross, August (no date given), Craig, June 28, 1936, Cazier, June 27, 1936, July 15, 1936; 16 (includes allotype), Imperial County, June 1912, on Experiment Farm, Bridwell; 4, Imperial County, June 1925, Field, July 1, 1925, Gehring; 2, Indio, July 17, 1923, Benedict, May 23, 1919, Slevin; 2, Meloland, June 4, 7, 1949, v. d. Bosch; 1, Needles, June 12, 1940, Barr; 1, Neighbors, Apr. 27, 1930, Hornung; 1, Palo Alto, July 28, 1916; 1, Vallecito, San Diego County, Sept. 15, 1945, at light, Martin; 2, Warners, June 18, 1925.

México: 3, 10 miles south of Catavina, Baja California, July 29, 1938, Michelbacher and Ross.

Paratypes in CAS, LAC, AMNH, CARN, INHS, CAL, OSU, CU, MICH, TEX, KAN, CDA, USNM, and the private collections of R. H. Arnett, D. K. Duncan, C. A. Frost, P. C. Grassman, Henry Howden, A. T. McClay, Gayle H. Nelson, F. H. Parker, Mark Robinson, and F. Werner.

Remarks.—Males of *B. imperialis* vary from 11 to 19 mm. in length, and from 7 to 11 mm., in width. In lesser developed males the punctures become fewer and weaker over the posterior third inside the arcuate carina at back of the head, anteriorly they persist strongly;

the clypeal horn decreases in height and its apex becomes narrow, sometimes rounded, but usually evidently truncate, and the anterior face vertical or sloping slightly backward; the median pronotal prominence is usually not constricted or narrowed basally.

B. imperialis is allied to *B. serratus* (LeConte), *B. regalis* Cartwright, and to *B. peninsularis* (Schaeffer), which I believe is a distinct species. Well-developed males of *B. imperialis* are separated from the other species by the anterior clypeal horn being relatively farther forward from the lateral horns, the triangle formed by the tips of the three horns approaching an equilateral triangle much more closely than in the other species. The apex of the clypeal horn is much narrower than in *B. regalis*, and usually truncate rather than rounded as in *serratus* and *peninsularis*; in fully developed males the inner lateral carina is doubly angulate as in *regalis* but has the high middle peak bent inward, while in specimens of *serratus* and *peninsularis* this carina is not higher or angulate at middle. The color of *serratus* and *peninsularis* is dark red-brown, of *imperialis*, a more yellow brown.

In *Bolbocerastes peninsularis*, represented by 13 specimens, 3 of them cotypes, the male clypeal horn is rounded as in *B. serratus* but is much farther back relative to the lateral horns, which are nearly as high as the clypeal horn. The female is more heavily punctate, as in *serratus*, and the area back of the median horn is much more noticeably punctate than in *imperialis*.

Bolbocerastes imperialis kansanus, new subspecies

Holotype male, length 17 mm., width 11 mm. Very similar to *B. imperialis*; moderately shining; darker in color; hairy beneath. Anterior face of the narrowly truncate clypeal horn vertical; lateral secondary horns more prominent; surface back of the clypeal horn with a noticeable swelling on each side and diagonally backward from the posterior ridges of the horn to a point even with the forward edge of the eye canthus, leaving between them a widening depressed area which merges with the general posterior level of the head; surface anterior to the arcuate ridge between the eyes more concave and much smoother than in typical *imperialis*; occiput smooth; eye canthus with a swelling diagonally inward from outer anterior angle.

Pronotum more coarsely punctate throughout; lateral edges of the median prominence more nearly cariniform and not constricted basally; median peak of upper lateral carina not bent inward; the depression back of the anterior angles at bottom of the lateral sinuses deeper, more noticeable, and distinct; serrations of the lateral margin appearing as thickenings of a single sharp edge; otherwise similar to typical *imperialis*.

Elytral striae deeper, nearly as in *B. serratus* (LeConte); the second stria basally indistinct over twice the length of the scutellum.

Aedeagus as in *imperialis*.

Allotype female, length 16 mm., width 11 mm. Similar to typical *B. imperialis* except that punctures are coarser throughout; foveae are deeper; elytral striae are deeper; and the eye canthus has a convex swelling diagonally inward from the anterior angle.

Type.—Holotype male, in Canadian Department of Agriculture collection.

Type locality.—Rush County, Kan.

Allotype and paratypes.—Allotype and 6 paratypes bear data as follows: Kansas: 4 (including allotype female), Rush County, Aug. 5, 1920; 2, Ness County, Aug. 5, 1920; 1, Ness County, 2,260 feet, July 5, 1912, Williams. Paratypes vary from 13 to 17 mm. in length, and 8 to 11 mm. in width.

Paratypes in CDA, KAN, and USNM.

Remarks.—*Bolbocerastes imperialis kansanus* may be separated from *B. serratus* (LeConte) by the doubly angulate upper lateral thoracic carina in well-developed males, by the diagonal convexity of the eye canthus, by the lateral serrations of the pronotum appearing as thickenings of a single sharp margin, and by the second elytral stria all but disappearing at twice the length of the scutellum. In *serratus* the serrations of the pronotal margin arise between the two edges of the doubly carinate margin and the second elytral stria becomes indistinct opposite the apex of the scutellum.

Bolbocerastes serratus (LeConte), new combination

FIGURE 14, *f*; PLATE 4

Athyreus serratus LeConte, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, p. 80, 1854.

Amechanus serratus Horn, Trans. Amer. Ent. Soc., vol. 3, p. 48, 1870.

Bradycinetus serratus Horn, Proc. California Acad. Sci., ser. 2, vol. 4, p. 334, 1894.

Athyreus (*Bradycinetus*) *serratus* Boucomont, in Wyttsmann, Genera insectorum, fasc. 7, p. 8, 1902.

Bradycinetus serratus Schaeffer, Trans. Amer. Ent. Soc., vol. 32, p. 251, 1906.

Bradycinetulus serratus Cockerell, Ent. News, vol. 17, p. 242, 1906.

Bolboceras (*Amechanus*) *serratus* Boucomont, Ann. Soc. Ent. France, vol. 79, p. 341, 1910.

Bolbocerastes serratus (LeConte) and *B. imperialis* Cartwright, except for fully developed males, are frequently difficult to separate. The locality label will help in most cases since *serratus* is found east of New Mexico, while *imperialis* is found in California, Arizona, and rarely into west Texas. The maps (figs. 15 and 16) show the known distribution. In doubtful cases the male genitalia will separate the two (see fig. 14, *f* and *g*). In *serratus*, the basal side or floor of the cavity is formed by the two sides approaching each other with knife-edges, sharply angulate near the outside margin (in *Bolbocerastes* the aedeagus of the male is hooded apically by the two sides coming together

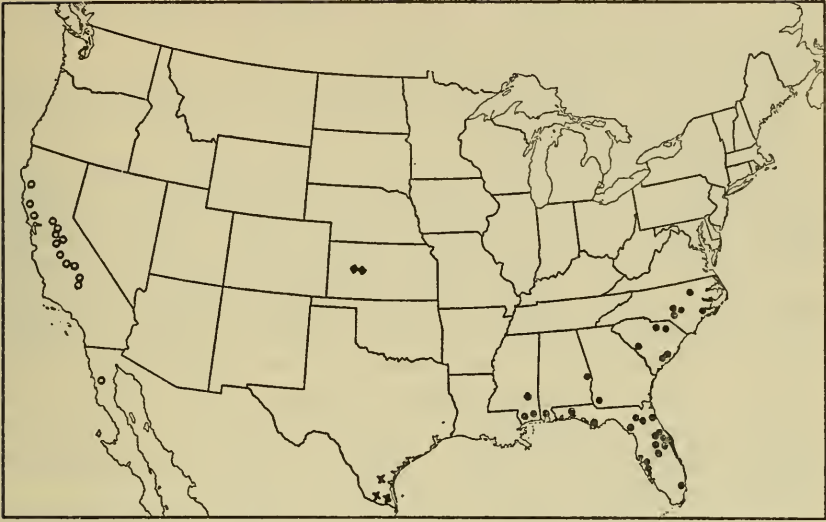


- *Bolboerastes imperialis* Cartwright x *Bradycinetulus rex* Cartwright
 ○ *Bradycinetulus fassatus* (Haldeman)

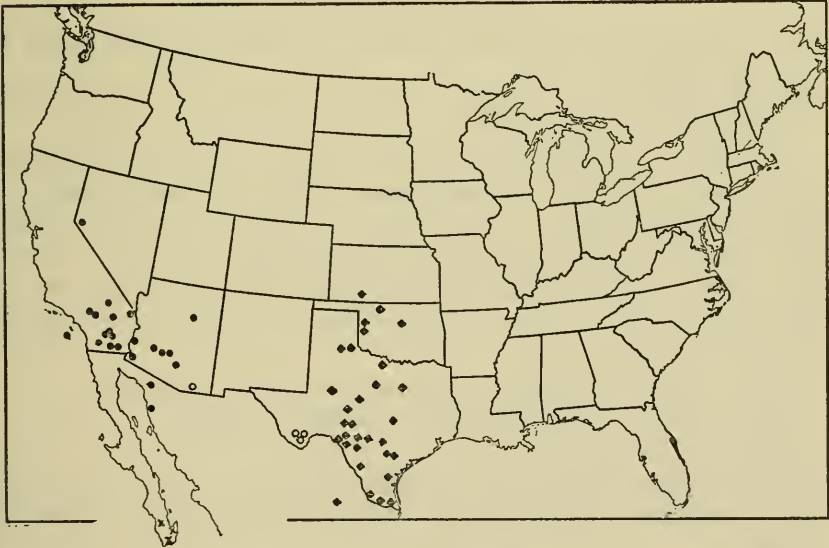


- *Bolborhombus echoefferi* (Boucomant) ○ *Bolbelasmus arcuatus* (Bates)
 x *Bolboerastes peninsularis* (Schoeffer)

FIGURE 15.—Distribution of species of *Bradycinetulus* and closely related species.



- *Bolbelasmus horni* (Rivers)
- *Bradycinetulus ferrugineus* (Palisot de Beauvois)
- × *Bolbelasmus minor* (Linell)
- ◆ *Bolbocerastes imperialis kansanus* Cartwright



- *Bolbocerastes regalis* Cartwright
- *Bolborhombus angulus* (Robinson)
- *Bolbocerastes serratus* (Leconte)
- × *Bolborhombus parvulus* Cartwright

FIGURE 16.—Distribution of species of *Bradycinetulus* and closely related species.

to form a deep cavity); in *imperialis*, these edges are rounded and lead straight in without a break or angle.

Type.—In LeConte collection, MCZ.

Type locality.—Mexican Boundary, Laredo to Ringgold Barracks.

Specimens examined.—181.

Distribution.—Kansas: Clark County. Oklahoma: Taloga, Cheyenne, *Alva, and *Payne County. Texas: Brownsville, *Beeville, Burnet County, Cypress Mills, Comal County, Cameron County, Caterina, Colorado City, Cotulla, Childress, Dimit County, Dallas, Dallas County, Edinburg, Eagle Pass, Fedor, Forestburg, Frio State Park, Goldthwaite, Hidalgo County, Kingsville, Laredo, Memphis, Menard, *Mineral Wells, New Braunsfels, Oakville, Plesanton, Reeves County, Round Mountain, Sabinal, Taloga, Uvalde, Weslaco, and Zavalla County. New Mexico: State label only (H. W. Wenzel collection). México: La Gloria, south of Monclova, Coahuila; and Rancho Preso, Nuevo León.

Season.—April 28 to September 25, with largest numbers collected in May, June, and September.

***Bolbocerastes peninsularis* (Schaeffer), new combination**

FIGURE 14, *d*; PLATE 4

Bradycinetus serratus var. *peninsularis* Schaeffer, Trans. Amer. Ent. Soc., vol. 32, p. 252, 1906.

Bolbocerastes serratus var. *peninsularis* Boucomont, in Schenkling, Coleopterorum catalogus, pt. 46, p. 13, 1912.

All specimens of this species examined have been dull, smooth, and of a uniform very dark red-brown color. The male is quite distinctive (see pl. 4, lower right). In the female the moderately high cephalic horn is twice the width of the tip of the clypeal horn and the secondary lateral horns or tubercles are usually more prominent than in *B. imperialis*. The carinae between these and the clypeal horn are strong and well marked.

Type.—Lectotype male, present selection, USNM 42568.

Type locality.—Santa Rosa, Baja California, México.

Specimens examined.—13.

Distribution.—California: 2, State label only, CARN. México: Santa Rosa, San Felipe, La Paz, and San Ignacio, all in Baja California.

Season.—July 27 to October 1.

***Bolborhombus*, new genus**

Mandibles arcuate externally. Head, male and female, without median frontal horn. Pronotum serrate laterally; apex with a carina paralleling anterior margin, the interspace interrupted behind each

eye by a distinct rather deep foveola; base margined. Scutellum triangular, with base straight, sides arcuate. Elytra not margined at base; seven discal striae, the first two interrupted by the scutellum, the second sometimes indistinctly forked opposite the apex of scutellum. Two prosternal spines in tandem behind anterior coxae, the posterior more or less hastate. Metasternal plate rhomboid in shape, the posterior angle acute and with adjacent edges cariniform, the lateral angles with adjacent edges rounded; the intercoxal lobe deeply concave and with strong cariniform lateral edges.

Genotype.—*Bradycinetus carinatus* Schaeffer, 1906 = *Bolboceras schaefferi* Boucomont.

Key to the species of *Bolborhombus*

1. Clypeus of male carinately margined in front, the very wide clypeal horn arcuate anteriorly, a low sharp carina arcuate in opposite direction behind the clypeal horn, which is midway between this and the carinate anterior margin; female unknown.....**angulus** (Robinson)
 Male clypeus not distinctly carinate along anterior edge but with parallel carinae extending back from anterior angles to the external angles of the tip of the horn.....2
2. Postapical carina of pronotum sharp and slightly undercut; male with short, distinct carina back of clypeal horn arcuate anteriorly, in same direction as clypeal horn; female smoother back of corresponding carina than in front of it; small shining species; 8 to 10 mm. (Baja California).
parvulus new species
 Postapical carina of pronotum rounded; male without carina or with faint indication of two low obscure tubercles back of clypeal horn; female equally rough behind and in front of carina; usually dull or only moderately shining (excepting some very large specimens, which may represent a subspecies); larger species, 11 to 18 mm.....**schaefferi** (Boucomont)

Bolborhombus angulus (Robinson), new combination

FIGURE 14, b

Bolboceras angulus Robinson, Trans. Amer. Ent. Soc., vol. 73, p. 170, 1947.

Bolborhombus angulus (Robinson) is a small rufotestaceous species, 7 to 11 mm. in length, readily recognized by the form of the head and clypeus. The wide straight anterior edge of the clypeus is strongly carinately margined. Behind this, from side to side and almost in line with the anterior edges of the ocular canthi, is a moderately high anteriorly arcuate ridge or horn, and still farther back a lower posteriorly arcuate sharp carina. The median horn tends to become somewhat nodose at the ends and is approximately midway between the posterior carina and the carinate anterior edge of the clypeus. In other characters *angulus* is very similar to *B. parvulus* and to small specimens of *B. schaefferi* (Boucomont).

Type.—In Mark Robinson collection, Philadelphia, Pa.

Type locality.—Dog Canyon, Brewster County, Tex.

Specimens examined.—4, including the holotype.

Distribution.—Texas: Dog Canyon, Glenn Spring, and Boquillas, all in Brewster County. Arizona: Miller Canyon, Huachuca Mountains.

Season.—July 7 to 29.

Bolborhombus parvulus, new species

FIGURE 14, a

Holotype male, length 9 mm., width 6 mm. Shiny, rufotestaceous, densely hairy beneath. Clypeus extending obliquely upward and backward to top of clypeal horn; the anterior face practically flat, its surface closely, very coarsely punctate, with the forward edge convex and deeply reticulate-punctate, the lateral edges parallel and sharply cariniform; upper edge of the horn shallowly emarginate, the external angles only slightly tuberculiform, from them a moderately high, sharp carina curving back each side and ending somewhat abruptly close to the innermost edge of the eye; surface of head back of horn uneven, with close, mixed fine and coarse punctures and with a short, elevated, transverse, anteriorly arcuate carina midway between the similarly punctate, sharply edged, concave, depressed ocular canthi; the carina about one-third as long as the width of the clypeal horn; the punctures back of the carina not quite as close as in front; the occiput smooth, closely, minutely punctate.

Pronotum with three rather deep foveae close behind the finely margined anterior edge, one median, the others opposite inner eye margin on each side; a sharp postapical carina, slightly undercut on posterior side, starting on each side of the middle fovea and passing close behind the lateral foveae toward but not quite reaching the serrate side margin at about anterior third; a second short, similar carina on each side straight back from near the end of the postapical carina to the inner anterior edge of a strong lateral fovea; a shallow, coarsely punctate groove half way across the pronotum upward and backward from each of the three anterior foveae; a row of close coarse punctures in the lateral and basal marginal line, a few in the basal half of median line, and scattered coarse punctures on both sides of the lateral carina and continued upward to opposite the humerus, with mixed fine and minute punctation throughout; anterior angles slightly more than a right angle; posterior angles obtusely rounded; base distinctly margined. Scutellum with mixed, very fine and minute punctation.

Elytra not margined basally; striae weakly impressed; strial punctures fine; first two striae interrupted by the scutellum; intervals weakly convex; the surface minutely punctate, very finely alutaceous under moderately high magnification.

Metasternal plate twice as wide as the lobe between the middle coxae, roughly punctate, and hairy along posterior edges. Prosternal spine 4-cornered, with the anterior angle curving down to a sharp point between the coxae and with the lateral angles on a transverse level and the posterior curving downward to form a sharp spine.

Allotype female, length 9 mm., width 6 mm. Apparently identical with the male in every way except in characters of the head. Clypeus rising steeply at somewhat less than a right angle to a sharply carinate edge seven-eighths as wide and parallel to the turned-under anterior margin; the flat face enclosed being a little less than one-third as high as long, then dropping sharply and gradually up again with the lateral edges slightly diverging to the top of the very wide median horn, which is widely and deeply emarginate at middle, leaving the two ends, or external angles, as rounded, thickened, backward-sloping prominences; back of the emargination, on the same level, and at a point midway between the ocular canthi, is a very short arcuate carina or elongate tubercle, behind which the general level of the head is noticeably lower; surface in front of the horn deeply, coarsely punctate-reticulate, between the horn and the tubercle roughly coarsely punctate, and behind the tubercle much smoother, with dispersed, mixed fine and shallow, coarse punctures; occiput smooth, practically impunctate.

Type.—In California Academy of Sciences collection.

Type locality.—Triunfo, Baja California, México. Holotype male collected Aug. 7, 1938, Michelbacher and Ross.

Allotype and paratypes.—Allotype female, CAS, and paratype male, USNM 61656, San Venancio, Baja California, México, Oct. 8, 1941, Ross and Bohart; paratype female, USNM 61656, Santa Rosa, Baja California, México, Charles Schaeffer collection.

Remarks.—*Bolborhombus parvulus* is very near *B. angulus* (Robinson) and is about the same size. The four specimens vary in length from 8½ mm. for the smaller male to 10½ mm. for the larger female. The anterior edge of the clypeus, described as margined in *angulus*, is almost exactly the same as in the female of *parvulus*.

***Bolborhombus schaefferi* (Boucomont), new combination**

FIGURE 14, c

Bradycinetus carinatus Schaeffer, Trans. Amer. Ent. Soc., vol. 32, p. 251, 1906.
Bolboceras schaefferi Boucomont, Ann. Soc. Ent. France, vol. 79, p. 347, 1910.

Bolborhombus schaefferi (Boucomont) averages much larger than *B. parvulus* and *B. angulus*, measuring 11 to 18 mm. in length, but it is very similar in all characters except those of the head, clypeus, and aedeagus. Males show considerable variation in the clypeal horn.

In smaller specimens the clypeus slopes upward and backward from the wide straight anterior edge to the narrower but moderately wide and somewhat anteriorly arcuate apex of the horn, the external angles of which are thickened to slightly nodose. In large specimens the external angles of the horn become strongly elevated tubercles, in some individuals wide apart, in others relatively close together. The head back of the horn is densely, quite coarsely punctate, occasionally with a short, obscure, anteriorly arcuate carina or very low binodose tubercle. In the female the anterior edge of the clypeus is nearly vertical to the sharply carinate margin. Well back and nearly in line with the anterior edges of the ocular canthi are two widely separated, conical tubercles with a fine anteriorly angulate carina between them and a low median swelling or tubercle close behind them. The tubercles are usually strongly developed but occasionally in small specimens may appear only as slight thickenings of the ends of the angulate carina.

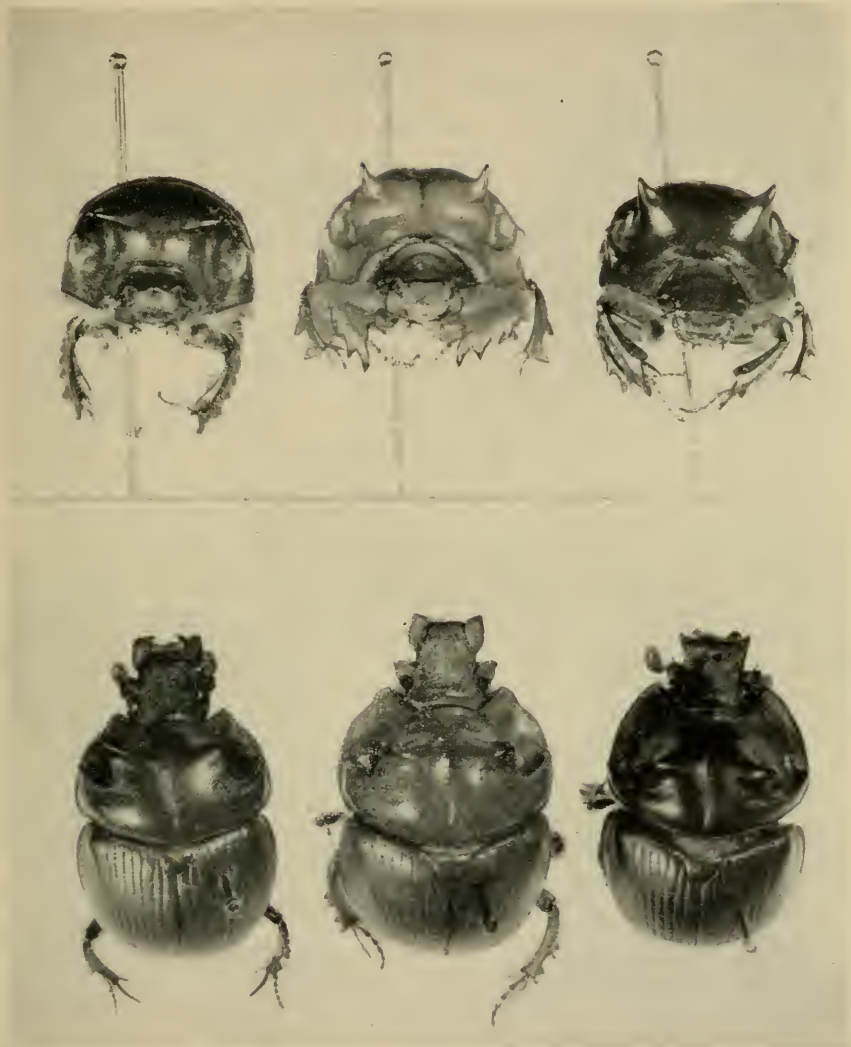
Type.—Lectotype male, present selection, USNM 42569.

Type locality.—Palmerlee, Cochise County, Ariz.

Specimens examined.—104.

Distribution.—Arizona: Cave Creek and Pinery Canyon (Chiricahua Mountains, Cochise County), Dewey, Douglas, Globe, Huachuca Mountains, Fort Huachuca, Kits Peak (Rincon, Baboquivari Mountains), Nogales, *Oracle, Palmerlee, Patagonia, Prescott, Reddington, Madera Canyon (Santa Rita Mountains), and Tucson. Texas: *Alpine, El Paso, *Fort Davis, Kingsville, and Round Mountain. México: Alamos (Sonora), Venedio (Sinaloa), Oaxaca (Oaxaca), Santa Rosa (Baja California), Naco (Sonora), Tlahualilo, and Río Mayo.

Season.—July 1 to October 10, with largest numbers in July and August.



Front and dorsal views of three species of *Bradycinetulus*: Left, *B. fossatus* (Haldeman); middle, *B. rex*, new species; right, *B. ferrugineus* (Palisot de Beauvois).



Differences in the clypeal horn in *Bolbocerastes*: Upper left, *B. serratus* (LeConte); upper right, *B. regalis*, new species; lower left, *B. imperialis*, new species; lower right, *B. peninsularis* (Schaeffer).

